

**CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY OPERATIONS**



OFFICE OF MAINTENANCE

**SNOW & ICE
GUIDELINES**

Rev. 10-1-13

PREFACE:

The following snow and ice guidelines are based on best practices and the current available materials and equipment. Updates to this manual should be conducted on a three year cycle to keep current with changes in technology. Changes in materials or strategies should be reviewed by all Bureaus for input to ensure that all impacts to the transportation infrastructure and environment have been considered.

**STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
SNOW AND ICE CONTROL**

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1.0000 Snow and Ice Control on State Highways

1.0100 General Principles

The State of Connecticut and its economy depend upon the all-weather use of our streets and highways. When the State system is closed or the capacity reduced, the traveling public, industry and commerce are all affected. Also, accidents due to snow and ice on our pavements can be very costly in terms of property damaged, personal injuries and human life.

1.0200 Definition of Terms

The terms “shall, must, should, recommended and may” used in Section 5 have the following meaning:

Shall, Will and Must	-	A required course of action
Should and Recommended	-	A suggested course of action
May	-	An optional course of action

1.0300 Goal

The Department’s goal is to provide highways that are passable and reasonably safe for vehicular traffic as much of the time as possible within the limitations imposed by weather conditions and the availability of equipment, material and personnel. It is recognized that due to resource limitations and weather conditions, pavement surfaces will be snow covered and/or slippery some of the time. The traveling public must exercise caution and drive appropriately in those situations.

1.0400 General Operating Procedures

1.0401 Winter Season

The period from November 1 through April 30 is defined as the winter season. A constant state of snow and ice readiness shall be maintained during this time period. All necessary preparations shall be made prior to November 1. In general, vacation time will not be authorized during this time period. However, compelling circumstances may be considered.

The Transportation Maintenance Director may authorize the approval of extended vacations (more than 3 days) when the individual will be unavailable for snow and ice assignment. The Transportation Manager will review time off requests of 3 days or less. Approvals may be granted if, in their judgment, operations will not be seriously impaired. General Supervisors may approve leave requests during this time period, provided that the employee understands that he/she will report for duty if storm conditions develop. Example...If employee is off on vacation and at noon a snow storm begins, he/she shall contact the supervisor according to the NP-2 contract.

1.0402 Winter Storms Considered Emergency Conditions

Each winter storm must be considered as an emergency condition. Preparations for snow and ice operations, and the operations themselves, must be carried out with this in mind. Each eligible employee and each piece of snow and ice equipment shall have a specific assignment during winter weather events.

1.0403 Supervisory Responsibilities During Winter Storms

Supervisors are directed to spend their time during storm conditions supervising field operations under their jurisdiction. Since General Supervisors have radio communications capability, they shall supervise operations by having first-hand information of field conditions and will quickly and effectively make corrections and adjustments to cope with changing conditions. Also, General Supervisors will be in a position to see that operations are being carried out in accordance with these guidelines to the fullest extent possible.

1.0404 Start of Storm

Prior to leaving the garage, the assigned operator will make sure that the truck has a set of chains, is loaded with the prescribed snow and ice control materials, the spreader is properly set for the type of material to be applied, and the plow is installed in its proper position and ready for use. If there have been any last minute changes in assignments, the operator shall be made aware of them and the new duties outlined so that there will be no confusion at the start of the storm. Snow and ice materials will be applied at the approved application rates as directed by the supervisor.

1.0405 Storm Warnings

Emergency weather advisories will be broadcast immediately upon receipt throughout storms and during normal working hours. During off-duty hours, the emergency weather advisories will be passed on to the Transportation Maintenance Managers or their alternates, by the storm monitor on duty, two hours in advance of adverse weather, if possible.

As soon as a snow or ice storm actually commences in any District, the Transportation Maintenance Manager(s) in that District shall immediately notify the proper storm monitor assigned to the Office of Maintenance and Highway Operations. The monitor shall relay the information to the other Transportation Maintenance Managers so that they will be better able to make decisions relative to their District responsibilities. The District Radio room will relay additional storm advisories to the Transportation Maintenance Manager's Office. Manager's Aides will then contact each General Supervisor in the Section and apprise them of the advisories. Additional warning systems may be arranged between the personnel of different Districts.

1.0406 Reporting Road Conditions During Winter Storms

General Supervisors must be aware of roadway and weather conditions in their respective territories and be able to report such conditions. The Manager's Aide, the General Supervisor's Aide and the District Storm Control Monitors are key links in the chain of communications and must be fully informed with up-to-date conditions. They must receive the data about their territories, document it, and pass it on, in an orderly manner at the established time schedule. Conditions of an unusual or critical nature must be reported immediately, regardless of the reporting time schedule. Traffic tie-ups and marked changes in road conditions must also be reported as soon as possible.

1.0407 Parked and Stalled Vehicles During Winter Storms

Whenever a vehicle is parked or stalled on the highway in such a manner as to be a hazard to motorists, or to hamper plowing operations to the extent that the highway may become blocked, it shall be considered as an obstruction and shall be removed by maintenance crews at once to the shoulder or to a nearby location where it is no longer in the way. In order to provide for this, every truck and loader will be equipped with a tow chain. Prior to removing a vehicle, the crew will check to see if there are any occupants. In the event there are occupants in the vehicle, and they are suffering hardship, assistance will be rendered immediately. In any event, the State Police, through the Transportation Manager's Office, will be notified of the status of the occupants and the location of the vehicle.

1.0408 Rural Mailboxes

When there is a heavy accumulation of snow, the location of mailboxes close to the highway makes the push-back operations difficult and renders the boxes susceptible to damage. It is the Department's practice to avoid, as much as possible, the leaving of a windrow of snow in front of rural mailboxes and to use special care and consideration when plowing in their vicinity.

Mailboxes and posts are available through stores and may be requisitioned by the Transportation Maintenance Director. The procedure for handling claims or complaints for knocked down mailboxes or damaged mailboxes is as follows:

When the General Supervisor receives notice of damage to a mailbox, the General Supervisor or Crew Leader will investigate. If it isn't certain that the Department plowing operations caused the damage, the owner shall be advised to file a claim in accordance with the established procedure. If it appears that the Department's plowing operations caused the damage and the box or post can be repaired without replacement, then it shall be done as soon as possible by Department forces.

If replacement of the box or post is required, the proper requisition shall be completed, approved by the Manager, and forwarded to the Transportation Maintenance Director. The Transportation Maintenance Director will confirm the responsibility to replace the damaged box or post through the District Claims Investigator. It is no longer necessary to use the MVCU1 Fleet Accident Report for mailbox claims. Instead, the Maintenance Director shall prepare a memorandum to the Claims Section of the Office of Purchasing and Materials Management.

The memorandum shall state whether plowing operations were taking place on the date in question, and if maintenance forces were aware of any possible damage occurring. The Claims Section will accept the memorandum as a completed investigation. The Claims Section will arrange with the District to complete the work. All claims or complaints will be appropriately closed-out for all situations.

1.0409 Post Storm Evaluation

Each Manager will hold a post-storm evaluation after the first storm, when a full callout is ordered. During the remainder of the winter season, evaluation for every other storm, or as necessary, shall be held to review operations and initiate actions to obtain the highest level of service possible. Evaluations shall be conducted at the following levels:

- Garage Level: General Supervisors, Crew Leaders, Operators and Maintainers
- Managers and General Supervisors
- Administrator, Directors and Managers

Results of these meetings may be used to update these Guidelines

1.0410 Meal Procedure

The preferred method of payment for winter meals is the use of the States P-card program. The General Supervisor shall inquire with the restaurants in their assigned area to see if they participate in the Master Card program. Whenever possible, the restaurants that accept the credit cards shall be used. If there are not sufficient restaurants available in the area, the Manager may request approval to use a core blanket purchase order. The Manager may approve the change of a restaurant throughout the winter season. Prior to November, the General Supervisor shall contact the management of the restaurants to explain the meal procedure and the Maint 78 form. Each vendor shall be supplied with the Maint 78 package. At the end of a storm or activity, the General Supervisor shall compare the Maint 78 and the guest slip and verify that the proper amounts are being charged. Payment will be processed based on the current procedures for P-card or non-P-card Meal Payment Procedures.

Operational employees should obtain their meals from restaurants located on their plow runs or areas of responsibility to avoid prolonged periods of service interruption. If there is no restaurant on the assigned plow run, the General Supervisor will select the closest restaurant for employees to use. The General Supervisor must be in conformance with article 42 of the NP-2 Contract. When necessary, plowing echelons may be broken up during mealtime. When trucks stop at eating establishments, warning lights shall be shut off and vehicles shall not be left running, unless conditions warrant the continued operation of defrosting equipment.

1.0411 Annual Calibration of Material Spreaders

1. As stated in the Winter Truck Proposal, all acceptable contractors who are required to have material spreaders, will be required to have their material spreaders calibrated. It will be the contractor's responsibility to have his/her spreader calibrated, at no cost to the state.
2. All material spreaders, whether state-owned or contracted, must be calibrated annually and settings must be checked before each storm, in order to apply the snow and ice control materials at the specified rates.
3. A 6/cy load of salt and a spreading speed of 30 M.P.H. will be the basis for calibration for most trucks. A 5/cy load will be the basis for the few V-Hopper spreaders still in the fleet. After setting the engine speed to the required RPM with the throttle, make necessary adjustments to: gate opening, conveyor speed and spinner speed.

4. Each General Supervisor will be responsible for all calibrations to be performed within their assigned section
5. A calibration card must be completed for all material spreaders and displayed inside the truck cab.
6. A record showing the date of calibration, truck equipment number, make of the material spreader and material spreader equipment number, must be turned in to the Transportation Maintenance Director when calibration of the unit is complete.
7. In the event that minor adjustments are needed prior to the start of the Snow and Ice season (November 1), each General Supervisor must arrange to have those adjustments made immediately. During storms, and while spreading operations are in progress, further adjustments to spreader equipment may be required, due to moisture and other conditions that may effect application rate.

1.0412 Rented Equipment

A representative of each District shall appraise the mechanical condition of all trucks and other equipment, including examining the repair facilities of the vendors being considered for rental by the Transportation Maintenance Director from information tabulated on the "Winter Truck Rental Inspection/Preliminary Data Sheets," the District shall determine whether the truck, including plow and spreading equipment, meets State requirements as outlined in the Bid Proposal. The contractor will be required to provide a certificate of insurance coverage before a purchase order will be issued.

The General Supervisor will make certain that the truck owner understands the terms of the contract award, the work assignments, travel time allowance and sources of salt and sand. For each truck rented, the General Supervisor shall execute the form entitled "Winter Truck Rental Inspection/Preliminary Data Sheets" signed the by the vendor. The vendor shall retain the original copy; the second copy shall be retained by the General Supervisor with copies sent to the District Planning Office and to Staff Maintenance Planning.

1.0413 Use of Rented Trucks

Rented trucks are employed to supplement equipment of the Department and are to be called out, as needed, during storms and used in accordance with the special provisions of the contract award. Each truck shall be given a definite work assignment under a specific General Supervisor who will be responsible for its performance, departure, allowing time out for

the operator's meals, changing work assignment temporarily, and reporting the use of the truck on the "Winter Use of Contractors Trucks" form (Exhibit 1).

Trucks, which are selected and fully available (including all paperwork), will be eligible for minimum guarantees in accordance with the bid specifications.

1.0414 Other Rented Equipment

During the course of the winter season, other types of rented equipment may be required for short intervals. When renting equipment for short intervals, established purchasing procedures shall be strictly adhered to.

1.0415 Procedure for Withdrawal of Salt and Liquid Deicer

The Maintenance Supervisor will approve all Inventory Withdrawal Documents on their workload by 10:00 a.m. each day during snow storms. The Material Storage Supervisor will finalize the Inventory Withdrawal Documents which automatically adjusts the inventory balances (MRL). The Material Storage Supervisor will coordinate delivery schedules with the General Supervisors. Delivery tickets should be forwarded to the Material Storage Supervisor the following morning after deliveries.

The General Supervisor will report to the stockroom immediately after the storm. The stockroom, if necessary, orders material so the General Supervisor will have sufficient salt and liquid deicer for the next storm. The District Planning Office shall conduct a study, after every fifth storm or whenever a break in the weather occurs, comparing the amount of material reported used on the Inventory Withdrawal Document with the amount used via inventory sources for each Manager's area. Any major discrepancies will be investigated.

1.0416 Reserve Salt Piles

To ensure that an adequate amount of salt is available throughout the winter season, the Department has established Reserve Salt Piles at strategic locations. The use of this reserve material will be in accordance with the Guidelines for Reserve Salt Piles Administration, Control and Utilization (Exhibit 2).

1.0417 Transfer of Bulk Materials

The transfer of salt from reserve piles shall be accomplished in accordance with (Exhibit 3).

1.0418 References

Consult the “Maintenance & Services Unit (NP-2) Contract” and Department personnel memorandums for information concerning the following:

- Equalization of Overtime
- Vehicle Assignments
- Emergency Work
- Meal Policy
- Premium Pay – Item No. 440Q – Amended
- Rest Periods During Emergency Operations
- Availability of Employees with a Snow and Ice Assignment during Off-Duty Hours
- Exclusions from Hazardous Assignment
- Call-In and Recall
- Truck Assignments
- Management Rights

1.0419 Equipment Rates

Equipment type	Position	Q Rate
Loader	Operator	3
Loader with Snow Blower	Operator	4
Tractor with Snow Blower	Operator	4
Triaxle with Double Wing	Driver	4
Triaxle with Double Wing	Helper	3
Tandem with Double Wing	Driver	4
Tandem with Double Wing	Helper	3
Tandem with Single Wing	Driver	3
Tandem with Single Wing	Helper	2
9 Ton with Single Wing	Driver	3
9 Ton with Single Wing	Helper	2
9 Ton with Belly Scraper	Driver	2
9 Ton with Front Plow	Driver	2

1.1000 Preparation for Snow and Ice Control

1.1100 Objective

The objective of planning for snow and ice control operations is to have sufficient resources and knowledge to effectively combat snow and ice conditions that routinely affect the state highway system, within budgetary and available resource constraints.

1.1200 Goal

The goal of the preparation effort is to provide for a reasonable and timely response to snow and ice events that affect the state highway system and to provide for reasonably safe road conditions during and after storm events.

1.1300 Methodology

1.1301 Rationale for a Traffic Based Level of Response

Traffic volume has been selected as the basis for level of response primarily because it reflects (1) the degree of difficulty in snow and ice control, (2) the speed of vehicles using the facilities, (3) the relative skill and familiarity of the highway users generally traveling on the highways, and, (4) the number of people that are inconvenienced if our efforts are delayed.

1.1302 Highway Classification for the Purpose of Snow and Ice Control

Class 1 – (Limited Access Highways)-Includes interstate routes and ramps, and expressway routes and ramps and emergency routes; continuous service throughout the storm; roads and shoulders cleared to bare and wet pavement within reasonable time following storms.

Class 2 – (Primary)-Includes major and minor collector highways; reduced plowing; center generally clear, providing for one-wheel path of traction in either direction; limited service on these roads.

Class 3 – (Secondary/All Others)-Includes local roads and lower-volume roadways; low-level priority; roadway may be snow covered and passable but heavy snow accumulations may develop.

1.1303 Locations That Require Special Consideration

Locations where there are known problem areas, such as steep grades, intersections, sharp curves, bridges, rock cuts and railroad crossings should receive special consideration in planning snow and ice control operations, regardless of the highway classification. Areas or sections susceptible to sudden icing or subjected to abnormal drifting are also special conditions that warrant individual consideration. There are special

snow and ice areas that may require post storm snow removal. These include: ditches and culverts (to provide for proper drainage), bridges, intersections, signs, safety appurtenances, facility driveways and loading areas, and certain commercial areas that could otherwise possibly impair traffic flow and sight distance.

1.1304 Types of Snow and Ice Equipment That Should Be Considered During Planning

A. Loading Equipment

Sufficient loading capability must be provided to load trucks without unreasonable delays. Additionally, plowed snow must be removed from certain areas on and around the highways. Front-end loaders having sufficient capacity of about 2/cy are generally suitable for this purpose. Tractor/Backhoe/Loaders may be utilized in an emergency situation.

B. Graders

Occasionally, despite reasonable effort, snow pack will form on the highway. Graders are suitable for mechanically removing this pack. However, in most cases, they are too slow for efficient removal of ordinary snow from the highway.

C. Snow Blowers

There are some drifting areas where accumulating snow exceeds our capacity to remove it with plow trucks. For this situation, snow blowers having sufficient size and capacity are the only efficient way to open and/or keep the highway open. They are also useful in loading and hauling operations.

D. Light Weight Equipment

A variety of lighter plow-equipped trucks, including 1-ton trucks and 4x4 pickups, should be available to maintain rest areas and commuter lots.

1.1305 Equipment Readiness

Major repairs and overhauls of Snow and Ice equipment should be performed well in advance of the anticipated time of need. Adequate resources are needed to be available to perform this work. The goal is to have the Snow and Ice fleet ready by November 1. Stored equipment (plows, spreaders, snow blowers, etc.) should be given proper lubrication, protection and painting prior to storage. The conveyor chains on spreaders should be checked for lubrication during storage to prevent seizure. Whenever possible, spreaders should be stored under cover. Snow blowers should be started and dry-run periodically during the “off” season to ensure proper operation later. Proper preventive maintenance and daily

maintenance of multi-seasonal equipment is a good way to ensure readiness and proper performance.

1.1306 Personnel Readiness

The training of Snow and Ice personnel to safely and efficiently perform their duties should be a continuing effort. Basic snow and ice training for all new employees is essential. Training for both new and experienced employees shall be performed on an annual basis prior to the start of the winter season. All employees with a snow and ice assignment are considered essential personnel and shall report to their duty station even if the governor excuses non-essential personnel.

1.1307 Facilities and Stockpiles

Facilities and stockpiles should be located so as to keep deadheading minimized. Salt shall always be stored under cover. The preferred method is in a building. Storage must be in compliance with the Industrial Stormwater Permit and approved Stormwater Pollution Prevention Plans (SWPPP).

1.1308 Weather Information

Accurate weather information is essential to effective snow and ice management. Possible sources of this information should be known to all well in advance of the snow and ice season. Possible sources are:

A. Private Weather Forecasting Services

There are a number of private weather forecasting companies that offer a variety of services. ConnDOT has a contract with a private forecasting firm that provides for regional notification of anticipated snow and ice events and other severe weather conditions.

B. Road Weather Information Systems (RWIS)

Recent years have seen an increase in the use of RWIS systems at both the national and state level. These systems provide site specific weather and pavement condition data for both real time and forecast purposes. This tool can provide the manager with valuable information on when personnel will be needed, whether chemicals need to be applied and post storm conditions.

C. Knowledge, Experience, and Communication with Locations in the Storm Path

Over time people develop a sense of local weather patterns. Certain bridges and sections of highways tend to be possible problem spots. This information should be communicated to all employees that are likely to have snow and ice responsibilities for those areas. When general storms are approaching,

communication with Districts closer to the storm will yield valuable information on the timing and character of the storm as well as information on the cessation of the storm.

D. Other Sources of Weather Data

Local radio and television stations provide some weather information. The amount and priority are a matter of local station policy. Cable television provides access to a weather channel that provides forecasts 24-hours a day. The ConnDOT intranet site also has direct links to several weather providers from its home page. **Activation and/or snow and ice responses will be based on the Department's contracted weather service.**

1.1309 Snow and Ice Control Plan

Each District shall have a Snow and Ice Control Plan (District Snow Books). At a minimum this plan should include run descriptions, which include lengths and typical cycle times, chemical and abrasive application rates and amounts for the runs, equipment calibrations, staffing and equipment distribution. Cycle times should be recorded throughout the winter season and the times may be documented in future snow and ice plans. This information will need to be accurate to be valuable. Its purpose is to have in one document, all of the necessary information related to snow and ice control for a particular District. The information in this document should be shared with all of the personnel in the District, so that everyone knows what is expected.

1.2000 Storm Watch

1.2100 Objective

The objective for storm watch is to have a set of communication procedures in place, which will enable timely mobilization of sufficient personnel to effectively deal with snow, ice or other possible emergencies and provide the public and other agencies a forum for reporting potentially hazardous highway-related conditions.

1.2200 Goal

The goal for storm watch is to effectively use the selected set of communication procedures to provide timely response to snow, ice and other winter emergencies.

1.2300 Methodology

The methodology will vary among Districts and shall be based on such factors as traffic volume, historical rate and frequency of storms, population centers, shift change hours of large employers within the District, the necessity of maintaining access to vital services such as hospitals, emergency services, and the necessity of maintaining a consistent level of service on major routes of travel.

1.2301 Storm Monitor

The key to an effective snow and ice program is to have the necessary resources in place ready to go when the storm begins. In order to have the resources in place, a storm monitor(s) must be designated. That person's responsibility is to monitor all of the available forecast information and determine the approximate start time for the storm. With an approximate storm start time, type of storm, and anticipated temperatures (pavement and air) a decision can be made when to have the necessary people and equipment ready to begin snow and ice operations. Storm monitors should be activated when winter weather is forecast to occur during off-duty hours.

1.3000 Snow Control

1.3100 Objective

The main objective of these guidelines is to provide an acceptable standard of winter maintenance that will provide reasonably safe roads during and after adverse weather conditions throughout the winter season.

1.3200 Level of Service Goals

DEFINITIONS

Regular Level of Service. Snow and ice removal equipment shall be deployed to maintain the highest level operating conditions possible based on weather conditions and normal traffic flow. **Class-1 highways shall receive regular level of service continuously 24/7 throughout the winter season.** Regular level of service should be maintained on all other classes of highways between the hours of 4:00 am and 10:00 pm, Monday through Friday and on holidays. During isolated snow and ice events or other periods of reduced call outs, a minimum of one truck per echelon on Class 1 highways shall be deployed for the affected area.

Modified Level of Service. Snow and ice removal equipment shall be deployed to maintain reasonably safe conditions. Snow and ice control goals will vary based on traffic volume, time of day, weather conditions and other considerations as determined by the District Director. Modified level of service should be provided on all Class 2 and 3 highways between 10:00 pm and 4:00 am, Monday through Friday; and all day Saturday and Sunday, excluding holidays.

1.3300 Snow Control Methodology

1.3301 Preparation for Snow Control Operations

A two-way scraper plow will be assigned to each ConnDOT Maintenance truck. The plow will be set at an angle of 80 degrees to the road and be equipped with blades (cutting edges). This type of plow will be used for the start of all storms except when heavy accumulation is expected, in

which case, roll plows should be used. Snowplow blades shall be checked for wear at regular intervals during the course of plowing, not just at the end of each storm. Generally, the regular steel blades shall be worn to no less than 1" below the head of the bolt before replacing. All plows and spreading equipment should be mounted by November 1. During the winter season, equipment shall be serviced at the end of each storm. The use of a Truck Check List, (SAF-8), assists an operator in ensuring that all of the critical items are looked at on his or her truck. The trucks and spreaders **MUST** be thoroughly cleaned and lubricated at the end of operations associated with each storm.

Ballast, usually in the form of salt or abrasives, provides extra weight needed by the truck to obtain maximum traction for removing snow. The ballast must be removed when the truck is not needed for snow removal.

Blades (cutting edges) must be inspected by each driver and changed as necessary in order to prevent moldboard damage and wear. To provide the minimum possible response time to a storm, it shall be standard practice throughout the winter season, that at the close of each working day prior to weekends, holidays and when a storm is forecast, plows shall be attached, liquid tanks shall be mounted and filled, fuel tanks shall be filled and other necessary equipment preparation shall be accomplished.

Each snow and ice truck shall have a properly fit set of tire chains. Prior to leaving the garage for snow and ice control operations, the assigned operator shall be responsible for making sure those chains are carried and properly stored on the truck. Chains shall be correctly installed on trucks every Friday afternoon throughout the winter season. This ensures that all employees can routinely install chains on their assigned vehicles if needed.

Prior to leaving the garage for snow and ice control operations, the operator of each snow and ice truck shall make sure that:

- The truck is properly loaded with the proper material for the storm conditions
- The materials spreader has the proper settings for the material to be spread
- The plow(s) are installed and in proper position
- He or she is aware of the proper application rate and spread pattern for the anticipated storm conditions

Prior to rest breaks, meal breaks or end of shift, when drivers switch off, a dialog shall take place that includes the following;

- Current weather conditions
- Current road conditions
- Time of last application
- Special conditions
- Instructions from supervisor
- Status of equipment
 1. Fuel
 2. Materials
 3. Lug nuts
 4. Any malfunctions
- Status of Contractor Trucks

1.3302 Snowplowing Procedures – Mainline

A. General

Plowing should begin as soon as there is enough snow on the pavement to plow. This will allow ice control treatments to work more effectively. There are a variety of acceptable procedures that will facilitate the removal of snow from the highway and allow for reasonably safe traffic flow. They vary with local traffic conditions, the characteristics of the highway surface and available snow storage area. The paramount objective in all of these procedures is to avoid leaving significant windrows or berms of plowed snow between adjacent mainline (travel) lanes where reasonably possible. However, there may be circumstances where insufficient equipment or other conditions may exist that preclude plowing without leaving significant windrows in certain areas. In such circumstances, windrows may be left, but should only remain in such an area for as brief a period of time as reasonably possible.

On all routes, plowing speed will depend on road and traffic conditions. Plowing speed should be gauged by the distance snow and/or slush is cast or thrown by the plow. Under no circumstances shall the speed of a vehicle be such that the material is cast an excessive distance from the edge of the shoulder.

Plowing speeds shall be adjusted to prevent the showering of pedestrians, sidewalks, buildings, vehicles, at grade separations (bridges) and across narrow medians onto opposing lanes. Special care must be given to bridges and underpasses to prevent casting snow off the bridge and on to features below, and to not unduly restrict travel lanes in underpasses.

B. Two Lane – Two Way Traffic (secondary highways)

Acceptable plowing procedures may vary with storm conditions and available resources. Plowing shall always be done in the direction of traffic. The traffic lane and as much of the shoulder as is possible should be plowed clear of the snow in this operation. When a plow truck is plowing to the right as much of the pavement as possible should be cleared. Some reasonably small amount of plowing over the center line is necessary to clear the pavement. However, plow trucks shall always yield the right-of-way to oncoming traffic.

C. Multi-Lane Sections – One Way Traffic (expressways)

1. Close echelon plowing should be the method of choice for plowing expressway type highways. This may be the **SAFEST** and most effective option.
2. Plowing shall always be done with trucks moving in the direction of traffic. Snow should not be plowed to the side of the truck on which traffic has an opportunity to pass unless it is done as part of a close echelon plowing operation that minimizes passing opportunities and will have plowed snow quickly removed from the pavement surface, or the snow accumulation is light and very little windrow will be generated. In the later circumstance tandem or delayed plowing may be utilized.
3. Typically, most of the left lane should be plowed in the first pass, by plowing the snow to the left if the median is of adequate width to store the snow. Otherwise, snow may be plowed to the right as part of a close echelon or tandem plowing procedure. **In the event of a significant heavy snow, echelons should move to the right to maintain lanes and storage capacity. When plowing a two, three or four lane highway system, move over enough lanes to the right to push snow off the shoulder of the road. After the snow lightens up, move to the left lane to remove the snow from the other lanes. This will maintain maximum storage capacity and allow the echelons to remove the snow from all lanes. Manager approval is required for this process.**

4. As much of the remaining lanes as possible should be plowed in the second pass by plowing snow to the right.

If the trucks leave the mainline plowing operation to plow ramps and intersections, it is important that they return to the place they left off as quickly as possible in order to minimize the amount of time sections between “off” and “on” ramps remain in an unplowed condition.

5. There may be circumstances where insufficient equipment or other conditions may exist that preclude plowing without leaving windrows in certain areas. In such circumstances, windrows may be left, but should remain in such an area for as brief a period of time as possible.

1.3303 Plowing of Ramps and Intersections

In general, ramps and intersections should be plowed at about the same time as mainline sections. However, the character of the storm and traffic conditions may dictate that they be plowed earlier or later than the adjacent mainline sections.

1.3304 Plowing of Shoulders

After pavement is cleared, the full width of the shoulders should be plowed. It is particularly important that snow be cleared beyond the shoulder high point on banked curves in order to minimize possible re-freeze of snowmelt on the pavement. If conditions permit, shoulder plowing may be done concurrent with pavement plowing.

1.3305 Ramp Points, Crossovers and Gore Areas

Ramp points, crossovers and gore areas should be plowed during the storm. No backing will be allowed on the ramp or point area during a snow event. The driver shall plow the ramp to the best of their ability without leaving excessive points. Points shall not be bulldozed.

The use of crossovers during mainline plowing operations is discouraged. Interchanges should be used to the extent possible for the operational movement of plow trucks. When it is necessary to use a crossover it should be of sufficient width to allow the plow truck to be completely off both roadways.

1.3306 Plowing Back and Benching

After the storm is over, plowed snow should be plowed back as far as possible to provide snow storage space in anticipation of the next storm. Care should be taken by the Operator to avoid dragging the wing beyond the paved shoulder. Additional snow storage can be provided by plowing high level snow banks with the wing elevated. This is called benching. This is for areas that receive substantial amounts of snow where fence lines are not visible in the windrows. The wing should be at least three feet off the pavement to avoid hitting guide rail, hydrants, etc.

1.3307 Removal of Snow from Special Areas

A. General

After the storm is over, the shoulders, crossovers, points, and gore areas have been plowed and benching and pushing back operations are underway or complete, the removal of snow from special areas should commence. A list of any special areas, along with any special requirements should be maintained by the local garage. These operations require loading equipment and hauling vehicles. Front end loaders, heavy dump trucks and snow blowers are usually used for this purpose. If necessary, rental equipment may be considered.

B. Bridges

Accumulated snow should be removed from locations that could melt during the day, drain across the deck, and freeze at night. Bridge drainage features should be cleared to facilitate the designed discharge of water. Under no circumstances shall snow be deliberately deposited into water bodies, wetlands and other environmentally sensitive areas. Bridges having features that prevent plowed snow from leaving the bridge should have accumulated snow removed to make room for the next storm. Particular attention should be given to removing excessive buildup along concrete barriers on high volume, high speed facilities. Overtime or resources from other districts may be necessary for this operation to minimize the duration or to facilitate the cleanup effort during off-peak hours. Accumulated snow on bridge sidewalks shall be removed as soon as possible. The Districts shall develop a plan for the removal of the snow from bridge sidewalks that fall under State jurisdiction.

C. Impact Attenuators

When possible, accumulated snow should be removed from areas that could affect the performance of impact attenuators. This work may require overtime in order to minimize the time duration of the operation, or facilitate the cleanup effort during off-peak hours.

D. Banked Curves

When possible, accumulated snow on the high side of banked curves should be removed to the shoulder break to minimize the risk of melt water freezing on the pavement.

E. Sag Vertical Curves

When possible, drainage channels should be created in the snow banks on both sides of the highway at the low point in sag vertical curves to minimize the risk of melt water accumulating on the pavement.

F. Ditches and Culverts

Ditches and culverts having a history of snow melt water runoff problems should be cleared of accumulated snow prior to anticipated thawing weather.

G. Closed Drainage Systems

The inlets to closed (underground) drainage systems should be cleared prior to anticipated thawing weather.

H. Narrow Median

Accumulated snow should be removed from narrow median areas if it poses possible melt water problems that may otherwise interfere with the traffic control function of the median.

I. Guiderail, Median Barrier and Concrete Barriers (Non-Bridge)

Snow should be removed as close to guiderail, median barrier and concrete barrier as reasonably possible with plow equipment. The complete removal of snow from the traffic side of guiderail and median barrier is not possible with available resources.

1.3308 Vehicle Maintenance

After each event and when any special areas for snow removal have been addressed, maintenance of the equipment should commence. Trucks, material spreaders, loaders and other snow and ice equipment **must** be cleaned and greased.

1.4000 Ice Control1.4100 General

It is recognized that it is not possible to provide a “bare” or “wet” pavement surface all of the time. The characteristics of weather events and finite available resources preclude this possibility. The interactive effects of pavement temperature, air temperature, event intensity, and timing of initial treatment, operational cycle time, traffic volume, wind velocity, and solar energy have

profound influence on the effectiveness of our ice control measures. During those times when the pavement surface is not “bare” or “wet” it is incumbent on the driving public to perceive those conditions and operate their vehicles accordingly.

1.4200 Objective

The objective of ice control is to provide a reasonably safe pavement surface given the available resources and limitations imposed by weather conditions.

1.4300 Goal

The goal of ice control is to provide the safest possible pavement surface that climatic conditions and available resources will allow.

1.4301 General Instructions

It has been the field practice to put full loads of snow and ice control materials on the truck, regardless of the amount required for a full run. In order to allow this practice to continue, two conditions must be met: 1) the rated capacity of the truck must not be exceeded and, 2) only the amount of material called for in the guidelines shall be applied. The Transportation Maintenance Manager must approve any deviation from the amount or type of material designated by these guidelines. To obtain maximum effectiveness from salt and abrasives, it is necessary that the snow plows will be in the down position while materials are being spread.

1.4400 Methodology

1.4401 Ice Control Methods

There are four basic strategies recognized for ice control used by this Department and many other agencies in the field of snow and ice operations. They are anti-icing, deicing, delayed treatment, and temporary friction improvement.

A. Anti-icing

Anti-icing is a strategy that places and maintains a sufficient quantity of ice control chemicals on the pavement surface before or very soon after precipitation or ice formation begins. This is done to prevent bonding of snow and/or ice to the pavement. **This is ConnDOT’s preferred strategy for snow and ice operations.** When anti-icing methods are properly employed, they can achieve high levels of service for sustained periods of time. To achieve this success, air and pavement temperatures, precipitation type, humidity, origin and intensity of the storm and predictions from online and/or contracted weather services must be tracked and monitored.

B. Deicing

Deicing is a strategy for dealing with snow or ice that has already bonded to the pavement surface. Deicing is most effectively accomplished by spreading a coarse graded (rock salt) solid or pre-wet solid ice control chemical on the surface of the bonded snow or ice. The coarse particles will melt through the snow and ice, break the bond, and then produce a chemical solution that flows across the pavement surface between the packed snow/ice and road surface. Any loose snow or ice should be removed by subsequent plowing. Sufficient time is necessary to allow the salt to work before plowing commences.

C. Delayed Treatment

Delaying or not applying ice control materials is a tactic that may be used in support of the anti-icing strategy. Road and weather conditions must be closely monitored to ensure success with this tactic. This tactic should be considered when pavement temperature is likely to remain above freezing, or during “dry” snow and blowing snow events where pavement surface temperature is below 15° F and there is no residual ice control chemical on the pavement. Chemicals should not be applied in conjunction with plowing operations at these low temperatures. Usually, snow will not bond to the pavement and can be effectively removed by plowing alone. Traffic will whip the rest of the snow away. In this situation, chemicals, or the chemicals in abrasives, may make the snow stick to the pavement, causing icy spots that require continuing treatment.

D. Temporary Friction Improvement

Friction improvement is an immediate and short-term improvement in surface friction that is achieved by spreading abrasives or abrasives/chemical mixtures on the snow/ice surface. This method may be used for problem areas or hills. A major disadvantage of this method is that its effectiveness degrades quickly with traffic. Therefore, it is very important to monitor road conditions to determine if additional treatment is necessary.

ConnDOT will use a combination of A through D, above in what is termed a “Chemical Priority” ice control policy. This is simply using ice control chemicals as the material of choice, if they are likely to accomplish the desired objective.

1.4402 Preparation for Ice Control Operations

As with Snow Control preparation, it is critical to have all ice control equipment ready for mounting on the trucks well in advance of the first storm. In addition to the spreader units, attention should be given to the

liquid chemical equipment. Pumps and connections on the bulk storage tanks need to be inspected and serviced. Saddle tanks on the spreaders, along with hoses, connections and spray bar also need to be inspected and serviced. It is recommended that the saddle tanks be emptied back into the bulk storage tank at the end of every season.

1.4403 General Principles of Effective Ice Control

A. Prevent Pack – Don't Melt It

Timely application of chemicals very early in a storm, with appropriate follow-up applications, will generally prevent pack from forming. This strategy is more cost-effective and safer than trying to remove pack once it has formed.

B. If Chemicals Will Work, Use Them

If the conditions are favorable, ice control chemicals should be applied at the beginning of the storm. With the advent of liquid ice control chemicals, they could be used to treat the pavement at the beginning of or in advance of a storm, if conditions for their use are favorable. The use of abrasives when chemicals will work encourages the formation of pack. The overall resource requirements for dealing with pack are far greater than preventing pack by the timely use of ice control chemicals.

1.4404 Materials Used for Ice Control

A. General

There are a large number of chemicals and other treatments that are used for ice control. ConnDOT generally uses a variety – salt (Sodium Chloride or Rock Salt), Liquid Magnesium Chloride, Liquid Calcium Chloride, Liquid Sodium Chloride (Salt Brine) and Abrasives (Sand or Stone Dust). Chlorides in liquid form shall be used as part of an on-board wetting system with our spreaders. ConnDOT will continue to strive for the Best Available Technology when experimenting with other liquid deicers.

B. Salt (Sodium Chloride or Rock Salt)

Salt is the most common and least expensive ice control chemical. The ability of salt to melt ice or form brine is highly temperature dependent. At 30° Fahrenheit, one pound of salt will melt 46.3 pounds of ice. At 15° Fahrenheit, one pound of salt will only melt 6.3 pounds of ice. This characteristic of salt primarily dictates when it is used and how much.

C. Liquid Calcium Chloride

Calcium Chloride has much quicker low temperature ice melting characteristics than salt. The liquid calcium chloride ConnDOT uses shall be sprayed onto salt in the spreader chute as part of an on-board wetting system. The ability to spray it onto the salt in the chute gives the operator more flexibility to use the Calcium Chloride only when needed. When added to salt it improves the salt's melting characteristics at lower temperatures, accelerates the working time and reduces bounce and scatter. In the liquid form that ConnDOT specifies, the Calcium Chloride is about 32% by weight.

D. Liquid Magnesium Chloride

Magnesium Chloride also has much quicker low temperature melting characteristics than salt. The liquid magnesium chloride shall be sprayed onto salt in the spreader chute as part of an on-board wetting system or as an additive to our salt brine. In the liquid form that ConnDOT specifies, the Magnesium Chloride is about 30% by weight. All the advantages listed above for Calcium Chloride also apply to Magnesium Chloride.

Liquid Deicer holding tanks must be filled prior to forecast snow events. When filling or emptying the tanks, there should always be a second person present and employees shall wear all specified personal protective equipment (PPE).

E. Liquid Sodium Chloride (Salt Brine)

Salt Brine may be used at the Managers discretion for the pre-treating of roadways prior to storm events or in our truck-mounted pre-wetting systems at temperatures above 25°F.

F. Abrasives (Sand or Stone Dust)

Abrasives may be natural sand or manufactured sand, conforming to ConnDOT specifications. They provide immediate temporary improvement in the frictional characteristics of the pavement surface. While abrasives have a low initial cost, the cost per application is about the same as salt once the increased application rate, salt mixed in the stockpile and manpower costs are considered. The addition of after season clean up costs can dramatically increase the total cost of this product. Areas adjacent to certain bodies of water and certain aquatic species can be adversely affected by the use of abrasives. Sand is also very detrimental to drainage systems. It is a major source of blocked culverts and catch basins that need to be cleaned, and the material disposed of, by ConnDOT forces at the end of each winter season.

1.4405 Guidelines for the Use of Salt

A. General Considerations

The effectiveness of salt is highly temperature dependent. Pavement Temperature is the key temperature in this situation. Pavement temperature is seldom the same as air temperature. Starting about mid-morning, with solar warming, pavement temperature will exceed air temperature by as much as 40 degrees Fahrenheit. With nightfall, pavement temperatures will still be higher than air temperature for several hours. In early to mid-morning, pavement temperature may be lower than air temperature.

Absent the daily solar effects, seasonal geo-thermal factors do influence the relationship between air and pavement temperature. In early winter, pavement temperatures are generally warmer than air temperature. In late winter, pavement temperatures are generally colder than air temperature.

The ice content of a particular snow or ice event is another factor that influences the effectiveness of salt. There is a wide range in the ice or water content of snow and ice events. The ice content of snow can vary from about 10% to 90%. Sleet, freezing rain, pack and glaze all has ice contents in the range of 90%. With increasing ice content per inch of snow or ice, more salt is required in order to be effective.

Salt is more effective with higher traffic volume. Frictional effects at the tire-pavement interface tend to warm the pavement. Also, the mechanical impact of traffic tends to break up the ice once the salt has prevented or broken ice/pavement bond. Given the above, reasonable judgment has to be exercised in deciding when to use salt and how much salt to use.

B. Specific Application Rate Guidelines

The Departments' approach to ice control is proactive. Anti-icing is the preferred tactic to take, when appropriate. **Appendix D gives specific guidelines for anti-icing, deicing and temporary friction improvement operations.** The recommendations are in tabular form. The use of these tables requires knowledge of pavement temperatures and the ice bond characteristics prior to treatment. Application rates are shown for operations using untreated salt, treated salt and straight liquids. These application rates are based on the latest national research efforts and are meant to be a guide. Experience of individual highways or network of highways will determine exact rates.

C. Accuracy of Application Rates

The application rates specified in Appendix D should serve as targets. Actual application rates will be determined from calibration and may vary slightly from the target values.

D. Spreading Patterns - Salt (Solid)

The spreading pattern is dictated by the type of highway, number of lanes being spread and the character of the event. Adjustments to spread pattern can be achieved by changing the spreader's chute position, deflector position, spinner speed and direction of throw. Consideration needs to be given to the speed and volume of traffic on the highway being treated. Higher speed and volume highways will tend to spread material (liquid or solid) much quicker than on lower speed and volume highways. For high volume highways, concentrated distribution (Dead Spinner) (near the high point of each lane) of material should be considered. The most common cause of wider than desired spread patterns is excessive spinner speed.

1. Two Lane – Two Way Traffic

The most efficient pattern is to spread salt in about the middle third of the pavement. The normal pavement crown will allow salt brine to flow across the remainder of the pavement.

In simultaneous plowing/spreading operations, the spread pattern should be within the recently plowed area to prevent working brine from being plowed off. On out-and-return runs, spreading should be limited to the lane being plowed. Another option is to plow out and plow and apply back. In this case, you will have to double your application rate since you will be treating two lanes at a time. In situations where the salt does not appear to be working well, the spread pattern may be further narrowed around the centerline of the road.

2. Multi - Lane – One Way Traffic

Multi - lane highways usually carry heavier traffic volume. With the heavier volume, the spread pattern should be a concentrated windrow near the high point of each lane with a dead or near dead spinner.

E. Spreading Speed

The traffic characteristics of the highway will to some extent determine the speed of the spreading truck. On high speed/high

volume highways the speed will be faster than on low speed/ low volume highways. With increasing speed, “bounce” and “scatter” of salt becomes greater. Treating salt as it leaves the hopper with an on-board wetting system or using pre-treated salt reduces the “bounce” and “scatter” of the salt. The actual spread pattern should be checked periodically to be sure the salt is being distributed as intended.

F. Temperatures

All General Supervisors and Crew Leaders trucks are equipped with pavement temperature monitoring devices along with some of our fleet trucks. For accurate readings, snow should be removed from the pavement directly below the devices. For trucks not equipped with temperature monitoring devices, constant communication should be made with supervisory personnel.

Application rates are based on pavement temperature not air temperature.

G. Caution

Caution with late-in-the-day chemical application is necessary in post-storm conditions. There is a tendency for water/brine to re-freeze at night if traffic does not dry the pavement and/or pavement temperature is below the freezing point of the brine concentration on the road, treatment with abrasives is an option for these conditions.

1.4406 Guidelines for the Use of Abrasives

A. General Considerations

Abrasives, if required, should generally be used on hills or problem areas where low traffic volume, low pavement temperature and other factors will preclude chemicals from working properly.

B. Specific Abrasives Application Rate Guidelines

Abrasives, if required, shall be applied at 715 pounds of abrasives per lane mile.

C. Accuracy of Application Rate

The actual application rates will be determined from calibration data and may vary slightly from the target value.

D. Spreading Pattern

Abrasives shall be spread at a 5' to 6' width.

E. Spreading Speed

The spreading speed should be in the same range as plowing operations and will, depend on traffic, highway geometry and highway surface conditions.

1.4407 Guidelines for Pre – wetting Salt with Liquid DeicersA. General Considerations

The liquid deicer is added to salt to improve its low temperature characteristics, reduce bounce and scatter and accelerate working time.

B. Application Rate Guidelines

The spinner spray system sprays the liquid deicer onto the salt after it comes out of the dump body and before it reaches the spinner.

Mixing rate for this system is:

<u>System</u>	<u>Gals. of Liquid Deicer</u> <u>Per Ton of Salt</u>
Spinner Spray	10

This is the recommended rate to start. The rate may be adjusted as conditions warrant.

C. Temperature Guidelines (Based on Availability of Materials)

Above 25°F pre-wet with sodium chloride (salt brine)

Below 25°F pre-wet with calcium or magnesium chloride

1.4408 Guidelines for Anti-icing (pre-treating) with LiquidsA. General Considerations

Liquid deicing chemicals can be applied directly to pavement utilizing an adequately sized slide in tank or tanker truck with a spray bar. **ConnDOT will only use Salt Brine (23%) for this application.** This process may be used to pre-treat pavement or bridge decks and other icing prone locations in advance of a storm anywhere from several hours to several days in advance of the event. Under certain conditions, liquids may be applied during a storm. When using salt brine in this type of application, do not apply to pavements below 22° F. The following Table A gives suggested application rates.

Table A

SUGGESTED APPLICATION RATES FOR SALT BRINE ANTI-ICING	
	*Application Rate in Gallons per Lane Mile
Pavement Temperature °F	23% Salt Brine
32	30 gals/lm
22	40 gals/lm

** Application rates as high as 60 gal/lm have been successfully used in salt brine straight liquid applications. It is strongly recommended however, to start with the application rates as illustrated by this table. **Do not apply salt brine at temperatures below 22° F.***

B. Spreading Patterns - Liquids

Equipment typically consists of slide in a tank with a spray bar mounted in a dump truck. Liquid chemicals should be distributed on the pavement using streamer or pencil nozzles that lay strips of chemical about 10 inches apart, leaving untreated pavement between the strips. With salt brine, this method, or a fan spray type of applicator may be used. While these units have the capability to spray multiple lanes, best results have been achieved by spraying one lane at a time.

C. Spreading Speed

Spreading speeds for straight liquid applications will always be based on traffic conditions, pavement conditions and overall safety considerations. For straight liquid applications, spreading speeds may be between 30 MPH and 40 MPH on dry pavements when performing pre-treatment applications. When spraying during a storm, speeds will be lower based on conditions. **See Appendix E for more guidance on the use of straight liquid applications using brine trucks.**

1.4409 Special Considerations in Ice Control

A. General

Good judgment in the application of chemicals is a must.

Chemicals can be very effective under certain apparently adverse conditions or they may be very dangerous under some seemingly ideal conditions.

B. Time of Day

The time of day when chemicals are applied can greatly affect the action of that chemical. Spreading the appropriate material prior to the morning and afternoon commuter hours allows the material to work with the heavy traffic volumes to help break up any snow or ice on the road and get a brine solution started. **Care must be given to watch pavement temperatures when they start to fall, which may increase the potential for re-freeze. Refer to your application tables in Appendix D for appropriate action as pavement temperatures fall.**

C. Traffic Volume

The traffic volume greatly affects chemical action. Also, heavy traffic during the mid-part of the day may whip slush from the pavement, leaving it dry. On lightly traveled roads, traffic may only rut the slush, leaving it to freeze as temperatures drop at night, unless the slush is plowed off.

D. The No Treatment or Delayed Treatment Situation

Chemicals or abrasives should not be applied in conjunction with plowing operations at very low temperatures or when plowing blowing and drifting snow at very low temperatures. Usually snow will not bond to the pavement and can be effectively removed by plowing. Traffic will whip the rest of the snow away. In this situation, chemicals, or the salt in abrasives, may make the snow stick to the pavement causing icy spots. Pavement must be monitored closely to ensure that chemical treatment of the pavement can begin when needed.

E. Spot Treatments

In situations where conditions are present that require intermittent (spot) treatment (pavement of bridge icing potential, “blow-overs”, drifting or other snow and ice conditions that do not affect the entire State Highway system in a given area) it is recommended that only a portion of the “normal” response capability be utilized during this activity. The activity is called spot treatment.

F. Watershed Areas and Aquifer Protection Areas

Reduced salt usage may be considered for watershed areas at the request of the Water Authority. Consideration will be given to establishing reduced salt areas with the placement of signs. Roadway geometry, traffic volumes, posted speeds and previously engineered containment systems will dictate reduced salt usage.

G. Treatment of Drifts and Blow-overs

Drifting areas are defined as those locations on the highway system where significant quantities of snow can accumulate due to blowing snow, to the point where a lane or the entire highway may become impassable to vehicle traffic. These locations are usually found in cut sections and other areas having features that promote the accumulation of snow on the highway. Blow-overs occur along numerous locations on the highway system where wind occasionally blows snow across the highway and may accumulate to a few inches. However, lane or roadway closure is less likely in blow-over situations. This situation may occur adjacent to large open areas on the upwind side of the highway associated with drifts and blow-over areas. It is impractical to use passive snow control measures to control blowing snow in blow-over areas. Because of the large number of locations and the unpredictability of wind patterns, blow-overs can occur in any location where there are open upwind areas, sufficient wind velocity and transportable snow. Passive control measures, such as snow fence, should only be considered where there is sufficient accident history associated with the blow-over location.

H. Hard Pack

Hard Pack is formed when saturated snow is compacted by traffic, usually accompanied by a drop in temperatures and the resulting ice is bonded to the pavement. Our anti-icing procedures usually prevent this condition, but occasionally pack is formed and must be removed. With the exception of thin pack, removal is best done by mechanical methods, since the required amount of salt needed to melt the pack is not practical. A grader with or without ice blades is the best equipment for the job. The ideal time to remove pack is after the storm when the sun is out, however, other factors such as heavily traveled commuter routes may make it necessary to work on it at night. The recommended procedure is to apply a heavy application (300 lbs. +/-) of pre-wetted salt. Pre-wetted salt tends to eat through the pack and with time will break the bond at the pavement surface, allowing mechanical removal. On thin pack, the application of pre-wet salt is usually sufficient and any slush can be plowed off. Dry solid salt can be used if pre-wet salt is unavailable. **Plowing pack shall be accomplished at low speeds with the plow blade turned near the bull-dozer or straight position.**

I. Frost, Thin Ice and Black Ice

Liquid ice control chemicals directly applied to the pavement are an excellent treatment for frost, thin ice and black ice. ConnDOT shall only use salt brine or a salt brine blend for this application. They may be applied as a preventative measure, or to treat ice that has already formed.

1.4410 Spreading Equipment and Calibration

A. Spreading Equipment

Most spreading is accomplished with trucks having dual purpose bodies. The material is typically distributed at a point behind the driver's side of the cab and before the left rear drive wheels.

B. Calibration of Spreaders

All spreaders shall be calibrated each year prior to the snow and ice season and after major repair on the spreader. There are separate calibrations for salt and abrasives. The liquid pre-wetting systems also require calibration. Detailed calibration procedures for each type of spreader are available from the Department's Repair division.

1.5000 Stockpiling and Storing Chemical and Abrasives

1.5301 Guidelines for Storing Liquid Chemicals

Liquid chemicals shall all be stored in non-reactive containers, protected from vehicular traffic. All recommended handling procedures found in the manufacturer's Material Safety Data Sheet shall be followed. The containers, piping and pump systems should be inspected periodically for leaks in accordance with SWPPP.

1.5302 Guidelines for Storing Salt

All straight or treated salt shall be stored, covered and housed on an impermeable pad in an acceptable structure. Where acceptable structures are not available, salt shall be stored on impermeable pads and covered with secured waterproof tarpaulins. Any material remaining at the end of the season will be moved to suitable storage in compliance with SWPPP.

1.5303 Guidelines for Storing Abrasives that Contain Chemicals

All stockpiles of abrasives containing chemicals shall be placed on an impermeable asphalt concrete pad (having an impermeable membrane) and be completely enclosed in: (1) A structure that effectively keeps rain and snow off the abrasives, or, (2) waterproof tarpaulins that are effectively secured. This requirement is effective year round.

1.5304 Housekeeping

All work areas should be as unobtrusive as possible. They should be kept neat and orderly. After every storm, loose material around loading ramps, storage buildings, etc. should be gathered up and returned to the stockpile or storage building.

1.6000 Snow Stake Installation

1.6100 Objective

The objective of snow stake installation is to identify possible obstructions within the plowing and winging area that may interfere with the snow removal process.

1.6200 Goal

Install snow stakes at locations of possible obstructions within the plowing and winging area that may interfere with the snow removal process.

1.6300 Methodology

A. Timing

Snow stakes that must be driven into the ground should be installed before the ground freezes and well in advance of the first anticipated snowfall.

B. Materials

Material for snow stakes may vary from wooden stakes to delineator posts. Uniformity of material is desirable and the type of material used should reflect the class of highway.

C. Functional Characteristics

Snow stakes should be long enough to extend above the anticipated depth of snow in the area. The top six inches of the stake should be painted, flagged, taped, or have an appropriate colored delineator in place, to provide better visibility.

D. Obstructions that should have Snow Stakes

Generally, all solid objects within the plowing and winging area that are likely to be covered with snow, should be identified by snow stakes. These include, but are not limited to: Guide posts, ends of guide rail runs, culvert headwalls, traffic canalization devices, hydrants, gutters and isolated curb sections, catch basins, drop inlets and other drainage structures.

1.7000 Maintaining the Capability of Drainage Features

1.7100 Objective

The objective of maintaining critical drainage features is to minimize flooding during thaw conditions.

1.7200 Goal

Maintain the functional capability of critical drainage features so that flooding and ponding on the highway are minimized during periods of thaw.

1.7300 Methodology

A. General

Through knowledge and experience, the critical drainage features should have been identified. It is important to maintain their functionality throughout the snow and ice season.

B. Closed Drainage Systems

In order to maintain safe roadways and protect against flooding and freeze-overs, the top of catch basins and drop inlets should be cleared of snow and provided with reasonable means to prevent possible development of ice.

C. Open Drainage Systems

Prior to thaws and the subsequent runoff, it is advisable to remove packed snow and ice from the ends of culverts and their inlet and outlet ditches. At the beginning or middle of the winter, if water is flowing adequately underneath the snow, the snow should not be removed since this might allow the water to freeze and block the culvert. As the weather moderates and a continued thaw is anticipated, the snow and ice should be removed as indicated above. Weather forecasts will aid in making the decision whether or not to remove the snow. Generally, a forecast of two or more days of thaw indicates need for snow removal at known locations.

D. Structures

Finger joints, expansion joints and the bridge deck drainage systems should be kept functional during the winter.

APPENDIX A

GLOSSARY OF SNOW AND ICE CONTROL TERMS

SNOW PLOW TERMS

Air Foil A device placed on the back of a dump body or materials spreader that redirects and accelerates air passing over the truck. This is intended to keep the rear of the truck and materials spreader reasonably clear of snow build-up.

Angle of Attack The horizontal angle (less than 90°) formed in plan view where the plow blade face deviates from a position that is parallel to the front grill of the plow truck

Blade or Cutting Edge The replaceable portion of a plow that is closest to and is in contact with the pavement surface

Moldboard The portion of a plow between the top and the blade

One-Way Plow or Funnel Plow A front-mounted plow that will only cast snow in one direction (usually to the right)

Rake Angle The vertical angle of the plow blade (cutting edge) relative to a perpendicular line from the pavement surface

Reversible Plow A front-mounted plow that is adjustable to cast snow: left, right, or straight ahead

Snow Blower, Snow Thrower or Rotary Plow A front-mounted device, comprised of augers that move the snow to an impeller that throws the snow through a chute

Underbody or Belly Plow A plow that mounts between the front axel and the drive axel(s) of a truck or motor grader

“V” Plow A front-mounted plow that simultaneously cast snow to the left and right

Variable Geometry Plow This is a front-mounted plow with the ability to change the geometry of the moldboard

Wing Plow A plow mounted on either side of the side of the truck, or both, that extends the plowing width of a front plow or an underbody plow; can also be used for benching.

SNOW PLOWING TERMS

Benching or Shelving Removing the upper portions of accumulations of snow on the shoulder or near-shoulder, usually with a wing plow

Close Echelon Plowing Snow plows that are arrayed across the pavement in a way that prevents traffic from passing the operation. This prevents traffic from passing through windrows of plowed snow and may be the safest and most cost-effective procedure for high volume multi-lane highways

Snow Plowing The displacement of snow from paved surfaces with plows and wing plows

Snow Removal Physically relocating areas of accumulated snow. This is usually a slow operation that may be accomplished with loaders and snow blowers

Tandem Plowing Snowplows that operate in sequence, at a distance apart, that allows traffic to safely pass the operation

Windrow or Berm A linear (parallel to highway center line) accumulation of snow cast by a plow, other equipment or wind

Bulldozing The plow blade is set in a near straight position. This method is used for plowing pack at slow speeds, less than 10 mph

Watershed Areas The Department of Energy and Environmental Protection (DEEP) defines watershed areas as “Every body of water (e.g. rivers, lakes, ponds, streams, and estuaries) has a watershed. The watershed is the area of land that drains or sheds water into a specific receiving waterbody, such as a lake or a river. As rainwater or melted snow runs downhill in the watershed, it collects and transports sediment and other materials and deposits them into the receiving waterbody.”

Aquifer Protection Areas The Department of Energy and Environmental Protection (DEEP) defines watershed areas as “Any area consisting of well fields, areas of contribution and recharge areas, identified on maps approved by the Commissioner of Environment Protection pursuant to RCSA Sec. 22a-354b to 22a-354d, inclusive, within which land uses or activities shall be required to comply with regulations adopted pursuant to RCSA Sec. 22a-354p by the municipality where the Aquifer Protection Area is located (CGS 22a-354h).”

STRATEGIC AND TACTICAL TERMS

Anti-icing This is a proactive strategy that places and maintains a sufficient quantity of ice control chemicals on the pavement surface before or very soon after precipitation or ice formation begins. This is done to prevent bonding of snow and/or ice to the pavement. It can also be employed after a successful deicing operation. When anti-icing methods are properly employed, they can achieve high levels of service for sustained periods of time.

Deicing This is a reactive strategy for dealing with snow or ice that has already bonded to the pavement surface. Deicing is most effectively accomplished by spreading a coarse graded (rock salt) solid or pre-wet solid ice control chemical on the surface of the bonded snow or ice. The coarse particles will melt through the snow and ice, break the bond, and then produce a chemical solution that flows across the pavement surface between the packed snow/ice and road surface. Any loose snow or ice should be removed by subsequent plowing. **Sufficient time is necessary to allow the salt to work before plowing commences.**

Delayed Treatment Delaying or not applying ice control materials is a tactic that may be used in support of the anti-icing strategy. Road and weather conditions must be closely monitored to ensure success with this tactic. This tactic should be considered when pavement temperature is likely to remain above freezing, or during “dry” snow and blowing snow events where pavement surface temperature is below 15° F and there is no residual ice control chemical on the pavement. Chemicals should not be applied in conjunction with plowing operations at these low temperatures or when plowing blowing and drifting snow at these low temperatures. Usually, snow will not bond to the pavement and can be effectively removed by plowing alone. Traffic will whip the rest of the snow away. In this situation, chemicals, or the chemicals in abrasives, may make the snow stick to the pavement, causing icy spots that require continuing treatment.

Level of Service (LOS) Desired or observed pavement conditions at various points in time, during and after winter weather events

Temporary Friction Improvement This is an immediate and short-term improvement in surface friction that is achieved by spreading abrasives or abrasives/chemical mixtures on the snow/ice surface. This method may be used in low level of service situations and where low pavement temperatures exist (below 15° F). It is also useful on unpaved roads (with no chemical or the least amount of chemical possible). A major disadvantage of this method is that its effectiveness degrades quickly with traffic. Therefore, it is very important to monitor road conditions to determine if additional treatment is necessary.

ICE CONTROL MATERIALS TERMS

Abrasives Any solid material applied to the pavement to increase friction

Anti-caking Agent A substance added to solid ice control chemicals to prevent caking or adhesion of the individual particles

Brine A solution of one or more salts

Chemical Concentration The percent (by weight) of a chemical in a liquid or solid product

Chemical Dilution Reducing chemical concentration by adding water or other substances

Chemical Form The physical state of the chemical (solid or liquid)

Endothermic Absorbs heat or becomes colder when going into solution

Eutectic Concentration The solution concentration that will produce the eutectic temperature

Eutectic Temperature The lowest temperature that an ice control chemical will melt ice or prevent ice from forming

Exothermic Gives off heat or becomes warmer when going into solution

Gradation or Grain Size Distribution This is the proportion of solid material that is retained on specified screen sizes

Hydrometer A device used to measure the specific gravity of liquids

Hygroscopic The property of having the ability to draw water from the air

Ice Control Chemicals Any chemical applied to surfaces that will prevent ice from bonding or melt ice that has already formed

Liquid Chemical The liquid form of a chemical or combinations of chemicals; usually a solution

Mixed Abrasives A mixture of abrasives and ice control chemicals

Phase Diagram A graph that shows the relationship between: solution concentration, solution freezing point and solution (pavement) temperature

Solution A generally clear combination of water and other dissolvable substances

PPE Personal Protective Equipment

OPERATIONAL PROCEDURE TERMS

Dry Run Driving the snowplow route or run in non-snow and ice conditions to become aware of features that may impact snow plowing and spreading materials

Circle of Safety A visual technique used by equipment operators to gain awareness of evolving situations all around the equipment

Passive Snow Control The control of blowing and drifting snow by using snow fence, plantings or highway design features

Pre-wetting Adding a liquid ice control chemical, or water to solid ice control chemicals before placement on the road

Pre-treating Placing an ice control chemical on the road before the beginning of a winter weather event

Snow, Route or Run Maps These are maps that show individual or groups of snow plow routes under various level of service and available equipment conditions; hazards and special treatment areas are usually identified

Treatment Cycle Time The time it takes for a truck to return to retreat a point on the run, after treatment, including any reloading time; if reloading is required for every treatment run, it could be the time between leaving the loading point for successive treatment runs

Wet Run Driving the snowplow route run during winter weather conditions to identify features that may impact snow plowing or and materials spreading

MATERIALS SPREADER TERMS

Application Rate The amount of material being discharged per lane mile by the spreader or distributor (pounds per lane mile or gallons per lane mile) [discharge rate divided by the number of lanes being treated]

Calibration The procedure for determining that the desired rates of discharge are capable of being delivered by the materials spreader, and what settings of the control features will produce the desired rates

Discharge Rate The amount of material being discharged, per mile, by the spreader or distributor (pounds per mile or gallons per mile)

Spread Pattern The transverse distribution of the ice control product across the highway (middle third, full width, high side wheel path, strips, etc.)

Ground Speed Control the material being distributed by the spreader is automatically controlled to deliver the proper application rate, regardless of ground or truck speed

PAVEMENT CONDIDTION TERMS

Black Ice A popular term for a very thin coating of clear, bubble free, homogenous ice that forms on a pavement; there are a number of mechanisms that will produce thin ice

Blow-over A relatively minor accumulation of snow on the road that is primarily deposited by the wind. Road or lane closure would be unlikely if not removed.

Damp There is a light coating of moisture on the pavement, with no visible water drops

Dry No wetting is apparent on the pavement surface

Frost A “white” non-homogenous coating of ice that usually forms on surfaces when the air temperature is above freezing

Hard Pack or Snow Pack This is formed when saturated snow is compacted by traffic, usually accompanied by a drop in temperatures and the resulting ice is bonded to the pavement

Ice/Pavement Bond Compacted snow or ice that adheres to the pavement so strongly that only ice control chemicals or increasing pavement temperature will break the bond

Loose Snow Unconsolidated snow that can be blown by the traffic or wind into windrows, or off the road

Slush An accumulation of snow that lies on an impervious base and is saturated with water in excess of the freely drained capacity. It will not support any weight when stepped or driven on but will “squish” until the base support is reached

Snow Drift A significant accumulation of snow on a road that is primarily deposited by the wind. If not removed timely, road or lane closure could result.

Thick Ice A much thicker coating of ice on the pavement than thin ice, formation may result from: freezing rain, freezing of ponded water, or freezing of melt water that is not able to drain properly. It may be clear or milky in appearance, and is generally smooth although it can have a rough surface

Thin Ice A thin, clear coating of ice where the pavement surface can be seen; often called black ice

Wet The road is surface saturated with water from rain or melt water. Runoff and puddles may or may not be present

WINTER WEATHER TERMS

Blizzard A long duration, wide area, snow event that is characterized by a heavy rate of snowfall, high winds and low temperatures

Blowing Snow Airborne snow that is primarily being transported by the wind; precipitation may or may not be occurring

Drizzle Light rain that is characterized by very small individual water droplets

Freezing Rain Super cooled droplets of liquid precipitation falling on a surface whose temperature is below or slightly above freezing, resulting in a hard, slick, generally thick coating of ice commonly called a glaze or clear ice or non-super cooled raindrops falling on a surface whose temperature is well below freezing will also result in a glaze.

Frost Also called hoarfrost. Ice crystals in the form of scales, needles, feathers or fans deposited on the surfaces cooled by radiation or other process. The deposits may be composed of drops of dew frozen after deposition and of ice formed directly from water vapor at a temperature below 32°F (sublimation). Frost most often occurs when air temperature is above 32°F and pavement temperature is 32°F or below and is at or below Dew Point.

Heavy Rain Rain that seemingly falls in sheets; individual drops are not identifiable; heavy spray can be observed several inches above the pavement surface

Heavy Snow Snow that is falling at a rate of more than 1-inch per hour and visibility is less than ¼ mile

Light Rain Small liquid droplets falling at a rate such that individual drops falling on a wet surface are easily detectable

Light Snow Snow falling at the rate of less than ½ inch per hour: visibility is greater than ½ mile

Moderate Rain Liquid drops that are falling are not clearly identifiable on the pavement surface and spray from the falling drops is observable just above surface

Moderate Snow Snow falling at a rate of ½ inch to 1-inch per hour; visibility is greater than ¼ mile and less than ½ mile

Radiometer or Infra Red Thermometer A non-contact device that measures the surface temperature of pavements and other objects

R.W.I.S. (Road and Weather Information System) A system that is comprised of atmospheric and weather sensors, pavement temperature and chemical sensors, a computer and software system for arraying data and data analysis and a communications system to move the data from point of measurement to the end user

Sleet or Ice Pellets A frozen mixture of rain and snow (pellets) that had been partially melted by falling through a layer of the atmosphere having a temperature above freezing, and subsequently refrozen by a colder layer or air near the surface of the earth

White-out A short duration situation, within a snow storm, where visibility drops to only a few feet

APPENDIX B

STORAGE OF ON-BOARD WETTING SYSTEMS AND STORAGE TANKS

SUMMER STORAGE OF ON-BOARD WETTING SYSTEMS

It is important to properly store On-Board Wetting Systems to ensure their availability for the next Snow and Ice Season. Improper storage can lead major damage. The following are the recommended procedures for storing these units:

Empty the liquid deicer tank(s) into the bulk storage tank.

The pump should be flushed with a solution of warm water and then Non-Toxic Anti-Freeze. The Non-Toxic Anti-Freeze will prevent any residual water from freezing prior to the next spreading season. All tailgate tanks should be covered during seasonal storage.

When connecting and disconnecting electrical plugs, treatment with electrical spray or dielectric grease (for use with electrical equipment) is recommended to prevent corrosion and protect from intrusion of water.

All exterior surfaces should be thoroughly rinsed off with water to lessen the possibility of corrosion.

The system should be visually inspected for wear or other problems prior to storing for the summer. Any necessary repairs should be documented and brought to the attention of the Equipment Management Mechanic.

SUMMER STORAGE OF BULK STORAGE TANKS

As with the truck mounted on board systems, several areas of the bulk storage tanks need to be addressed.

The pump should be disconnected and then flushed with a solution of warm water and then Non-Toxic Anti-Freeze. The Non-Toxic Anti-Freeze will prevent any residual water from freezing prior to the next spreading season.

Electrical connections should be checked for wear. Any electrical plugs should be treated with electrical spray or dielectric grease to prevent corrosion and protect from intrusion of water.

Hose and pipe connections to and from the pump should be inspected for wear and repaired or replaced as appropriate.

It is recommended that de-icing liquids in bulk storage tanks be re-circulated (agitated) every two weeks during extended periods of non-use.

APPENDIX C

ConnDOT SAFETY GUIDELINES FOR HANDLING OF LIQUID CHEMICAL DEICERS

Personal Protective Equipment (PPE) must be worn when handling these materials. As a minimum, PPE gear includes splash goggles, face shield, rubber gloves, rubber apron, and rubber boots. A copy of the Material Safety Data Sheet (MSDS), for each chemical used, shall be readily available at every work site where these chemicals are being used. The MSDS will give further guidance on PPE requirements.

Two people minimum shall be present when filling liquid chloride tanks

Avoid contact with skin and leather apparel (boots, gloves, etc.)

Prior to pumping, check all hoses and piping to insure secure connections and sound hoses.

Prior to and at the end of pumping, check valve settings to insure proper flow control.

While pumping, stand clear of hose and pipe connection points.

Visually monitor tank filling to avoid overfilling.

When filling is complete, shut off pump, check valve settings, close all applicable valves and store fill hose properly (e.g. return to hose rack).

FIRST AID MEASURES

EYES:	Flush promptly with plenty of water continuing for at least 15 minutes. GET MEDICAL ATTENTION!!!
SKIN:	Wash with plenty of water.
INHALATION:	Remove to fresh air (for cases of airborne mist and dust)
INGESTION:	Contact Poison Control and/or refer to MSDS sheets for ingestion instructions.

APPENDIX C1
ConnDOT SAFETY GUIDELINES FOR
RESPONDING TO LIQUID
CHEMICAL DEICER SPILLS

Minor Spills (Less than 5 Gallons)

Put on appropriate Personal Protective Equipment (PPE) (splash goggles, face shield, rubber gloves and rubber boots).

If possible, safely stop the source of the spill (e.g. shut off pump, close valve, etc.).

Notify supervisor.

Contain spill with sand.

Spread sand to absorb the liquid chemical deicer.

Collect saturated sand and stockpile separately.

Cover stockpile with a waterproof covering.

When operation is completed, rinse down all equipment used with water only in accordance with SWPPP.

All spills major or minor should be documented on the “Internal Spill Reporting Form” contained in SWPPP.

Major Spills (Greater than 5 Gallons)

Follow the procedures outlined in SWPPP, including proper notification. Containment should only be attempted if it is safe to do so. Environmental Compliance will contact a spill contractor if the spill cannot be contained.

Put on appropriate PPE (splash goggles, face shield, rubber gloves, and rubber boots).

If possible, safely stop the source of the spill (e.g. shut off pump, close valve, etc.)

Notify the supervisor and area maintenance manager.

Contain spill with sand and spread the sand to absorb contained liquid chemical deicer.

Collect saturated sand and stockpile separately.

Cover stockpile with a waterproof covering.

When operation is completed, rinse down all equipment used with water only or wash equipment in the garage wash bay. This should be done within a contained area.

FACTORS THAT AFFECT APPLICATION RATE DETERMINATION

TRAFFIC:

AADT – Higher traffic volumes result in mixing action along with heat from friction. Higher volumes are also an indication of more important roads.

Rush Hour – This affects timing and maneuverability as treatments are applied ahead of the rush. In extreme cases, it may be necessary to avoid a road because trucks will be trapped and non-productive. Rush hours can also create a directional situation where good mixing action takes place in one direction and almost none in the other.

Day of the Week – Different days, especially the weekend create different traffic patterns and volumes and the application may need to be changed to adjust for this.

Corridors – This is an evolving issue, but has always influenced level of response. Certain roads are key to the function of the system and if they are not open, the rest of the system fails regardless of the conditions on the feeder roads.

ROAD CONDITIONS:

Geometrics – Steep grades, sharp curves, bridge decks, etc. all influence our application rates. Some of these situations determine the application rate for a whole beat, and others require the driver to make adjustments during his run.

Cold Spots – Areas at higher elevations or shaded most of the day create cold spots which normally require more material than adjacent sections of the run.

Length of Runs – This affects cycle time. The longer the time between plowings the more material is needed to prevent bonding. Narrowing of the spread pattern should accompany the increased application rate in this circumstance.

Plow Speed – Ideal plow speed will vary considerably due to traffic, adjacent buildings, pedestrians, high speed roadways, etc. This can create different cycle times between runs of the same length, or even the same run at different times of the day.

Multiple Lanes – While in some cases, a run consists a uniform number of lanes so that the assigned trucks can plow in echelon in one pass. However in most cases, the number of lanes varies and trucks have to double back or trucks from other runs have to be assigned to help. This results in increased cycle time.

Pavement Surface – Pavement treatments like Nova Chip and some Super-Pave mixes have an open graded structure which draws the brine away from the surface. More chemicals may need to be applied to prevent bonding.

WEATHER:

Time of Season – Usually, more chemicals are required in January than March because of colder pavement temperatures and continued cold weather is likely.

Sunlight – The amount and angle of sunlight influences pavement temperatures and the resulting melting action of ice control chemicals.

Type of Snow or Ice – The wetter the precipitation the more chemical dilution occurs, which requires more chemicals to keep the freezing point reduced.

Intensity of the Precipitation – The harder the snowfall the more chemical will be needed to prevent bonding before the next treatment.

Pavement Temperature – While changes in air temperature are useful to watch, the pavement temperature is what really matters. When deciding on application rates the expected trend in the pavement temperature is important to be taken into account.

APPENDIX D

APPLICATION RATE GUIDANCE FOR ICE CONTROL MATERIALS

The application rate guidance that appears in these guidelines is derived from the latest national research findings and the capabilities of the ConnDOT fleet of snow and ice trucks and materials spreaders (owned and hired).

APPLICATION RATES FOR SALT AND PRE-WET SALT FOR CURRENT AND ANTICIPATED CONDITONS

PAVEMENT TEMPERATURE, DEGREES F	ICE/PAVEMENT BOND	INITIAL APPLICATION RATE LBS./LM	FOLLOW-UP APPLICATION RATE LBS./LM
ABOVE 29°	NO	200	200
	YES	200	200
20° – 29°	NO	200	200
	YES	200	200
BELOW 20°	NO	200	200
	YES	*Mgr. Disc.	*Mgr. Disc.

NOTE: If pavement temperature is expected to fall below 15° F or below the freezing point of salt brine on the pavement, mixed abrasives may be used

The application rate for abrasives (sand) should be 715 pounds per lane mile

*Managers Discretion-Check with Manager for application rates

Appendix E

Guidelines for the use of Liquid Brine Trucks

General:

Liquid ice control chemicals are generally a solution of solid ice control chemicals with water being the predominate component. They support high levels of service in anti-icing and deicing strategies (in low ice content situations). They are well suited for the pretreatment of roadways and bridges for frost, black ice, and icing situations. After application, the water evaporates and the residual dry chemical is relatively immune to dispersal by traffic. The residual chemical will remain on the pavement surface for a period up to five days or until it is diluted by precipitation or blown/abraded off by the accumulation of traffic. Moisture from snow or ice will reactivate the chemical into solution form, and prevent or delay ice/pavement bond. This is also an effective way to initiate anti-icing prior to a winter weather event. Listed below are bullet guidelines for use of the liquid brine trucks for these purposes:

- All pretreatments shall be conducted using salt brine or a salt brine blend only at a 23% solution (85-90% Salinity) **Calcium chloride shall not be used for pretreatment of pavement.**
- Application should be made at maximum speeds of 30-40 MPH.
- The application rate should be 40-60 gallons per lane mile.
- **Applications should only be made at temperatures of 22° F and above.**
- Pretreatment should be prior to winter weather events and weekends if a precipitation or icing event is anticipated.
- Historical problem areas such as bridges, interchanges, turning roadways and cold spots should be targeted first.
- Targeted bridges should be treated a minimum of 100-feet prior to the structure and 50-feet after the structure.
- Each individual lane requires treatment on multilane structures.
- For treatment of frost/black ice or thin ice that has already formed, applying salt brine is an excellent practice, providing the temperature is above 22° F. Use an application rate of 60-70 gallons per lane mile.
- If rain is predicted at the start of a winter snow and ice event, pretreatment is not recommended unless the road temperature is below freezing (32°F).
- Application of liquid chemicals as a deicer directly on snow or snow pack is not recommended due to its limited ability to penetrate the pack.
- It is generally not advisable to use liquid chemicals during periods of moderate or heavy snow, sleet and freezing rain events.

EXHIBIT 1**WINTER TRUCK RENTAL INSPECTION/PRELIMINARY DATA SHEET**

ITEM # _____

WINTER SEASON: _____

ACCEPTED _____ **REJECTED** _____ **ON CONTRACT** _____ **OFF CONTRACT** _____

CONTRACT # _____ SUPPLEMENTAL CONTRACT # _____

CONTRACTOR'S NAME (DBA): _____

ADDRESS / TOWN / STATE: _____

GARAGE ADDRESS IF DIFFERENT: _____

TRUCK YEAR / MAKE / MODEL: _____

VIN #: _____ LICENSE PLATE #: _____

REGISTERED WEIGHT: _____

TRUCK WILL BE HIRED AS A CATEGORY (Circle One Category)**(1)** - 19,500 lbs. to 25,999 lbs. GVWR**(2)** - 26,000 lbs. to 31,999 lbs. GVWR**(3)** - 32,000 lbs. and over

IS THE GENERAL CONDITION OF THE TRUCK ACCEPTABLE: YES NO

IF "NO" EXPLAIN: _____

ANY VISIBLE DEFECTS IN THE SUSPENSION: YES NO

IF "YES" EXPLAIN: _____

TIRE CHAINS: YES NO SINGLE or DUAL

DEFROSTER WORKING: YES NO

HOIST WORKING / CAN HOIST LIFT PLOW: YES NO

GENERAL CONDITION OF TIRES: NEW GOOD FAIR POOR

DOES TRUCK HAVE AUXILIARY LIGHTS AND HEAD LIGHTS YES NO

FLASHING LIGHTS: ROTARY LIGHTS / VISIBLE 360° DEGREES YES NO

TWO (2) LIGHT SYSTEM YES NO

THREE (3) LIGHT SYSTEM YES NO

MOLDBOARD:**CATEGORY 3****MOLDBOARD:****CATEGORY 1 AND 2**

MINIMUM HEIGHT 30" YES NO

MINIMUM HEIGHT 30" YES NO

MINIMUM LENGTH 11 ft. YES NO

MINIMUM LENGTH 10 ft. YES NO

WILL ACCEPT STATE BLADES YES NO

WILL ACCEPT STATE BLADES YES NO

EXHIBIT 1 (continued)
WINTER TRUCK RENTAL INSPECTION/PRELIMINARY DATA SHEET

WILL TRUCK BE HIRED WITH A MATERIAL SPREADER: YES NO AS NEEDED BASIS

MATERIAL SPREADER TYPE: HOPPER COMBINATION BODY OTHER (SPECIFY BELOW)

CUBIC YARD CAPACITY: _____

VARIABLE SPREADING CAPABILITY: YES NO

GROUND SPEED WORKING: YES NO

DOES THE CONVEYOR AND SPREADER SYSTEM WORK: YES NO

NAME OF CONTRACTOR'S CONTACT PERSON
TO BE CALLED FOR ALL TRUCK CALL OUTS: _____

CONTRACTOR'S CONTACT PERSONS TELEPHONE INFORMATION: (Office) _____

(Home) _____ (Cell) _____

CONNDOT REPORTING GARAGE LOCATION: _____

NAME OF CONNDOT'S CALL OUT PERSON: _____

CONNDOT'S CALL OUT PERSONS TELEPHONE INFORMATION: (Office) _____

(Home) _____ (Cell) _____

MAPQUEST® DISTANCE FROM CONTRACTOR'S GARAGE TO CONNDOT REPORTING GARAGE: _____

COMPENSATED TRAVEL TIME: _____ 0 to 15 miles - ½ hour

_____ 15.1 to 30 miles - 1 hour

_____ Greater than 30 miles - 1½ hours

COMMENTS: _____

I hereby declare that I have read and am familiar with DAS Contract # _____ Rental of Trucks with Operators for the 20____/20____ Winter Season.

PRINT TITLE AND NAME
OF CONTRACTOR

SIGNATURE OF CONTRACTOR

DATE

PRINT TITLE AND NAME OF STATE INSPECTOR

DATE TRUCK INSPECTED

EXHIBIT 2**GUIDELINES FOR RESERVE SALT PILES ADMINISTRATION, CONTROL & UTILIZATION**

PURPOSE: Emergency salt piles are established and maintained to insure the availability of material throughout the winter season. Their primary use is for a reserve supply to supplement vendor delivery if vendor delivery is inadequate during the peak of the winter season. Their secondary use is for normal re-supply of working piles during the latter part of the winter season in lieu of vendor deliveries.

ADMINISTRATION: The Division of Purchasing and Materials Management is charged with the responsibility and the accountability for the quantity of material within each reserve pile and will maintain all necessary inventory control records. This task requires close cooperation and communication between the Office of Maintenance and the Division of Purchasing and Materials Management personnel.

CONTROL: Authority to open a pile will lie with Staff Maintenance, after a request from the District Maintenance Director for the piles under their jurisdiction in accordance with criteria set forth in these guidelines. District personnel will immediately inform the appropriate Material Storage Supervisor (or in cases when he/she is not readily available, the appropriate Material Manager) at the time of the decision is made to enter the reserve pile.

Prior to the actual transfer of material to a working pile, the Material Stores Supervisor or Material Manager responsible for the working pile(s) will be consulted to insure coordination between material transfers and vendor deliveries. Actual quantities of material transferred to a working pile from an emergency pile must be reported to the Material Manager to enable them to process a Physical Inventory Adjustment. This process will place the material in inventory for the working pile. In those cases where an emergency situation calls for the direct use of the reserve pile material on the highway system and no transfer to a working pile is made, the amount of material taken from the reserve pile will be reported to the Material Storage Supervisor.

EXHIBIT 3

PROCEDURE FOR TRANSFER OF BULK MATERIALS

Any transfers of Bulk Materials will be documented on **Form STO-013, Materials Delivery Slip** in order provide a uniform recording and accounting procedure. Form STO-013 available on the DOT Intranet under “Documents & Forms”; Materials Management (see below).

This procedure is intended to cover the transfers of bulk materials (salt, magnesium and calcium chloride) between working and reserve piles, but may be used for the transfer of any bulk stored material within the Department.

A knowledgeable person will be assigned at each shipping location to properly complete the STO-013 form. The current date and truck number will be noted in the space provided for “Project Number” and the town in which the shipping pile is located will be noted in the space provided for “Contractor”. The type of material and the quantity will be noted in the body of the form. The space provided for delivery location will be used to record the pile number and town of the designated receiving location. If it should be necessary to redirect a truck, the pile number, town and name of the receiving location shall be corrected.

Two copies will go with the load; one copy will be retained at the shipping location. Each day the tickets will be provided to the Material Storage Supervisor at the issuing location. One will be forwarded to the Material Storage Supervisor in charge of the receiving pile. The Material Storage Supervisor at the receiving pile will prepare and process the transaction in Core-CT Inventory.

MATERIALS MANAGEMENT

Title of Document	Document Description	
DISCONTINUED FORMS	from STORES 08-31-12	<u>Select</u>
Winter Commodity Computation Form	For Physical Inventory	<u>Select</u>
STO-13-Materials Delivery Slip	Commodities going into Stores	<u>Select</u>
STO-59	Physical Verification for Receipt of Bulk Materials	<u>Select</u>
Daily Sheet	Daily Sheet for Equipment Repair ChangesDailySheet.doc	<u>Select</u>
Inventory Adjustment Sheet	DOT Core-Ct Inventory Adjustment Sheet	<u>Select</u>
CORE_003 rev. 05-2013	Request to Add New Item Into Stores	<u>Select</u>
PER-144 Overtime	Request for Authorization of Paid Overtime	<u>Select</u>
Salvage Materials Returns	Salvage Materials Returned to Stores	<u>Select</u>
Service Order	Service Order Request	<u>Select</u>
Maintenance Log	For Sand	<u>Select</u>
Maintenance Log	For Salt	<u>Select</u>
Maintenance Log	For Liquid Calcium or Magnesium Chloride	<u>Select</u>
Scrap Pick-Up Sheet	Stores Scrap Pick-Up Sheet	<u>Select</u>